Advanced Accelerator Applications Technical Quarterly Review

(Covering January-June 2002)

Advanced Cavity Development

WBS 1.03

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PROGRAM OBJECTIVE

- The objective is to extend the lower limit on particle velocity for which superconducting accelerator cavities can be used in high power linear accelerators.
- Extending this lower limit to 6.7 MeV from the 211 MeV lower limit of the APT linac design, saving 21 Mwatts of power, results in annual savings of $8M in operating costs in this portion of the linac.
- Installed costs of normal-conducting and superconducting linacs are comparable.
- Major benefit of SC linac is installed redundancy which will provide higher operational reliability.

DEFINITIONS

RIA: The “Rare Isotope Accelerator,” under study by ANL and MSU which will facilitate investigations of the nature of nucleonic matter, the origin of the elements, and tests of the standard model through studies of exotic nuclei. Funded by DOE/HEP.

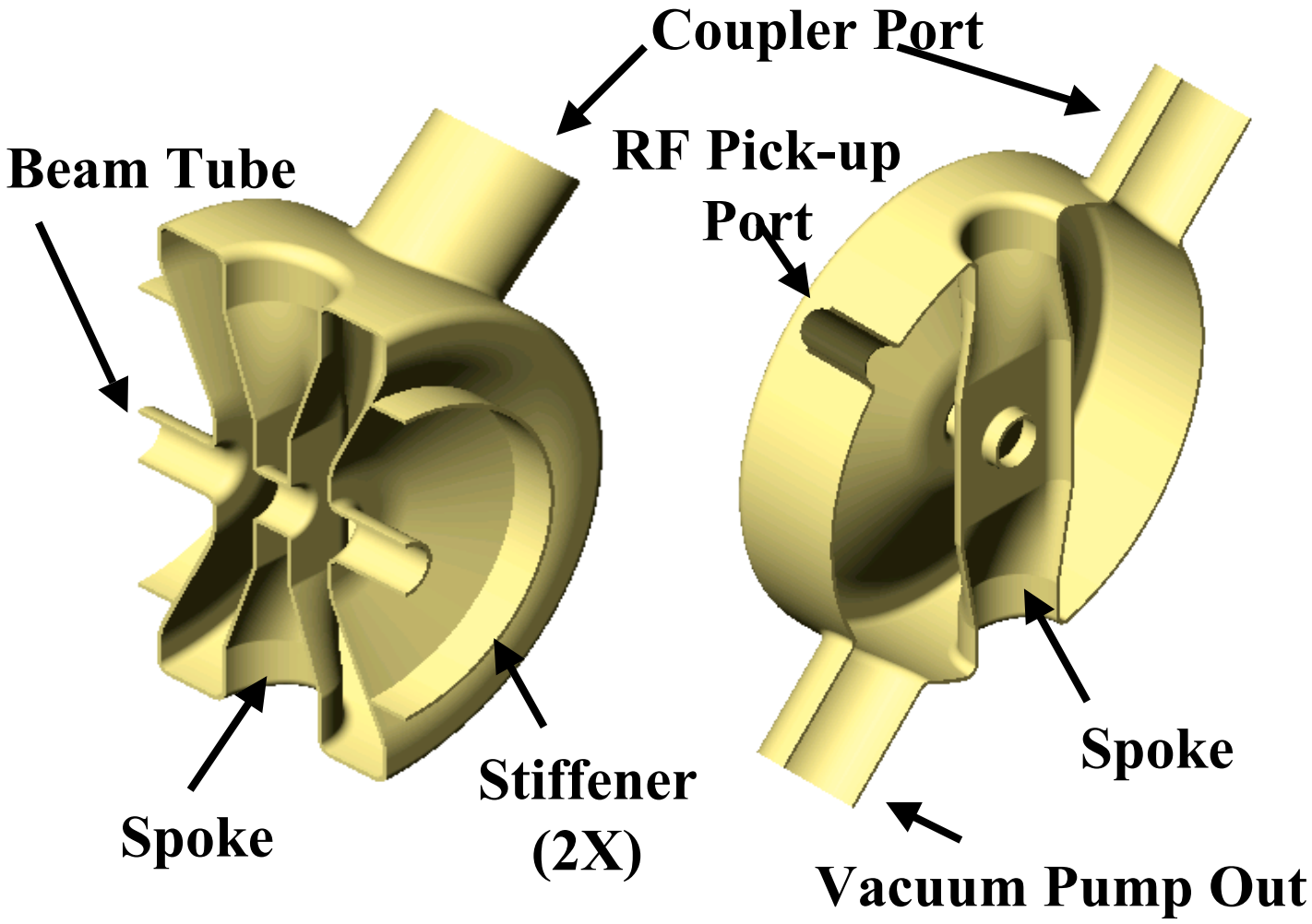
Q_o: “Unloaded Quality Factor,” This quantity is the most basic figure of merit in a resonator and gives the ratio of stored energy over wall losses in the resonator. A higher value (high electric field with low losses) is better than a lower value (low electric field with high losses).

β: the ratio of the particle velocity to the speed of light

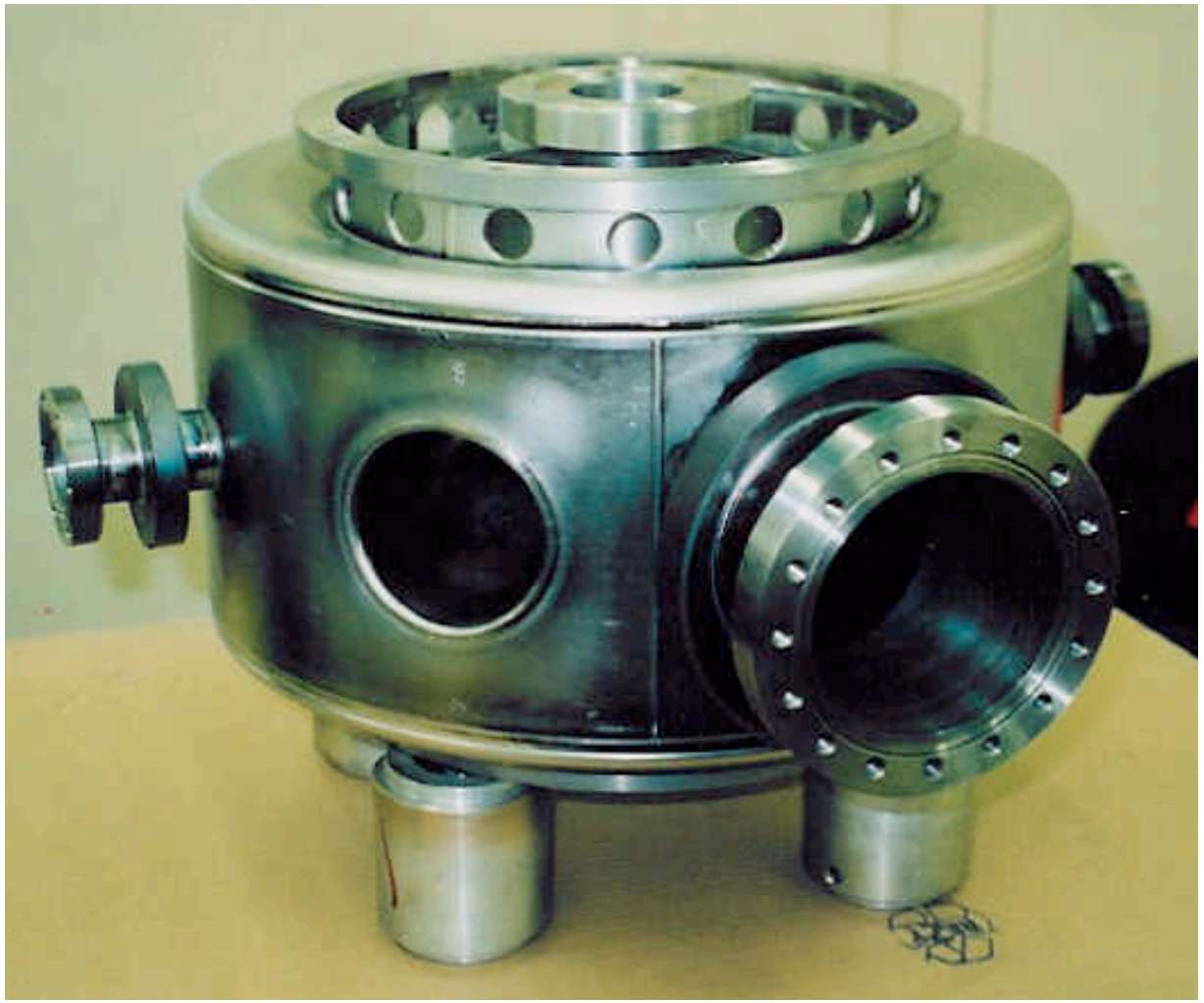
SPOKE CAVITY
2nd & 3rd QUARTER ACCOMPLISHMENTS

- ANL β = 0.40 RIA prototype cavity tested
- Demonstrated that Q_o degradation will not be a problem for 350 MHz cavities
- Two β = 0.175 cavities have been fabricated by E. ZANON S.p.A (Italy). Procured by APT Program in FY2001.
- Two β = 0.175 cavities have been shipped to LANL

□ = 0.1.75 SPOKE CAVITY



□ = 0.175 SPOKE CAVITY



SPOKE CAVITY
4th QUARTER PLAN

- Test two β = 0.175 spoke cavities in vertical cryostat
  - Measure Q_o
  - Measure achievable accelerating gradient E_{acc}
  - Verify predictions of mechanical properties
    - » Tuning sensitivity & stiffness
    - » Frequency shift under vacuum

DOE/CEA/CNRS COLLABORATION
2nd & 3rd QUARTER ACCOMPLISHMENTS

- Draft memorandum of agreement written
- Two draft work packages written
  - low-□ elliptical cavities
  - multi-gap spoke cavities
- Three meetings held in France
  - established senior executive committee
  - established technical steering committee

DOE/CEA/CNRS COLLABORATION
4th QUARTER PLAN

- Finalize memorandum of agreement
- Finalize work packages
  - low-β elliptical cavities
  - multi-gap spoke cavities
- Establish design requirements
  - low-β elliptical cavities
  - multi-gap spoke cavities
- Organize spoke cavity workshop for October 2002 at LANL (CEA, CNRS, ANL, JLAB, INFN, LLNL, Cornell, + others TBD)

PROPOSED FY2003 R&D BUDGET

PROPOSED BUDGET: $3M

1. Final tests & documentation of β = 0.175 spoke cavities
2. Design & place procurement of β = 0.125 spoke cavities under DOE/CEA/CNRS collaboration
3. Design & place procurement of elliptical cavities under DOE/CEA/CNRS collaboration